

WHAT IS CLAIMED IS:

1. A polyimide molding composition comprising:

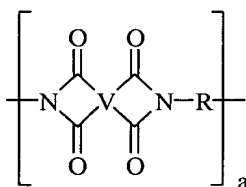
(a) at least one thermoplastic polyimide resin;

(b) at least one second thermoplastic resin which is chemically distinct from any polyimide resin; and

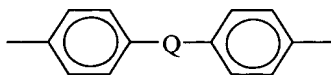
(c) a poly(diorganosiloxane).

2. The composition of claim 1, wherein a polyimide resin (a)

comprises repeat units of the formula

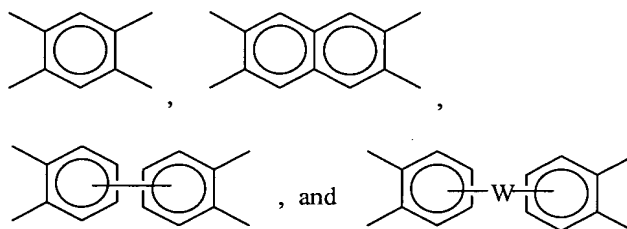


wherein a is an integer from about 10 to about 10,000; V is a tetravalent linker selected from the group consisting of substituted and unsubstituted, saturated, unsaturated and aromatic monocyclic and polycyclic groups having about 5 to about 50 carbon atoms, substituted and unsubstituted, linear and branched, saturated and unsaturated alkyl groups having 1 to about 30 carbon atoms; and combinations thereof; and R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; straight and branched chain alkylene radicals having about 2 to about 20 carbon atoms; cycloalkylene radicals having about 3 to about 20 carbon atoms, and divalent radicals of the formula

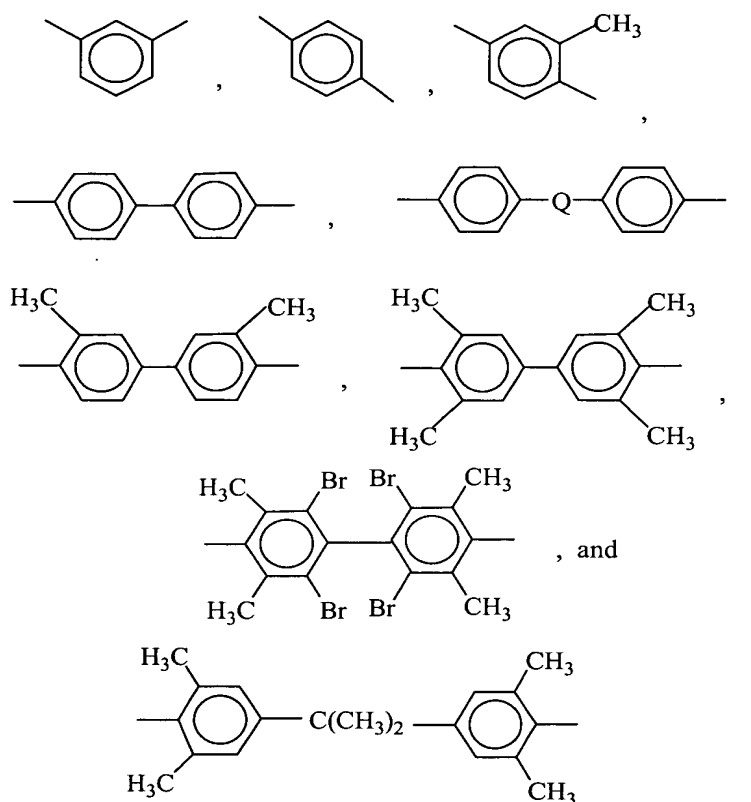


wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, and C_yH_{2y}, wherein y is an integer from 1 to 5, and halogenated derivatives thereof.

3. The composition of claim 2, wherein V is selected from
5 the group consisting of tetravalent aromatic radicals of formula

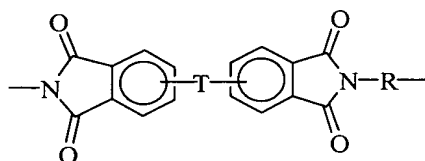


wherein W is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, C_yH_{2y} wherein y is an integer from 1 to 5, or a group of the formula -O-Z-O- wherein the divalent bonds of the -O- or the -O-Z-O- group are in the 3,3', 3,4', 4,3', or the 4,4' positions, and wherein Z is selected from the group consisting of divalent radicals of formula

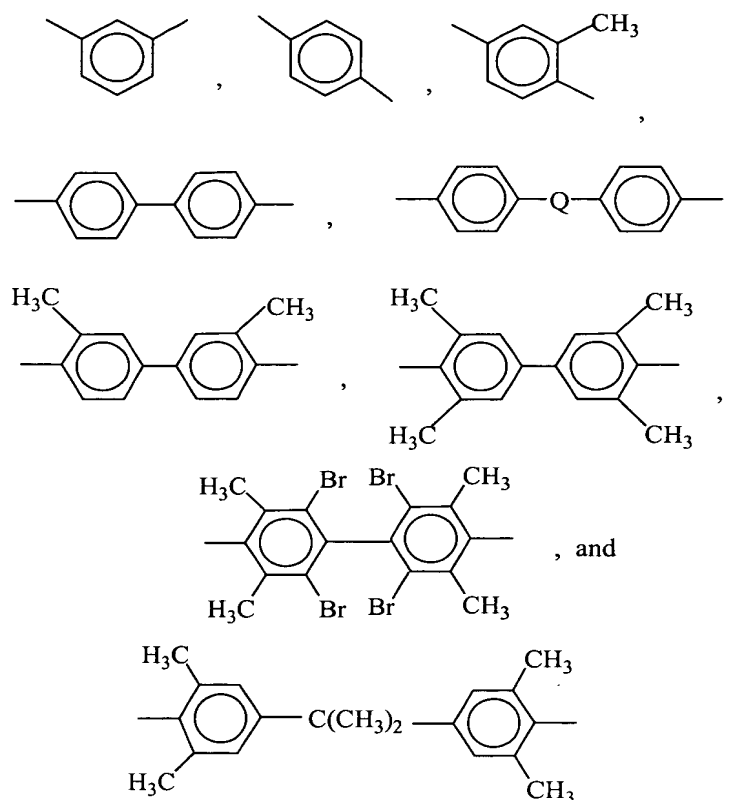


wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, and C_yH_{2y}, wherein y is an integer from 1 to 5, and halogenated derivatives thereof.

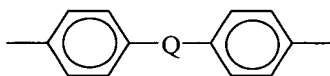
4. The composition of claim 1, wherein a thermoplastic polyimide resin comprises repeat units of the formula



wherein T is -O- or a group of the formula -O-Z-O- wherein the divalent bonds of the -O- or the -O-Z-O- group are in the 3,3', 3,4', 4,3', or the 4,4' positions, and wherein Z is selected from the group consisting of divalent radicals of formula

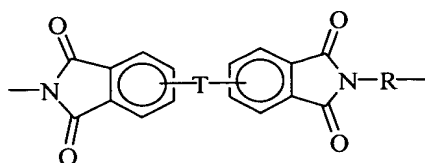


wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, and C_yH_{2y}, wherein y is an integer from 1 to 5, and halogenated derivatives thereof; and R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; straight and branched chain alkylene radicals having about 2 to about 20 carbon atoms; cycloalkylene radicals having about 3 to about 20 carbon atoms, and divalent radicals of the formula

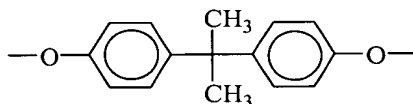


wherein Q is as defined above.

5. The composition of claim 1, wherein a thermoplastic polyimide resin comprises repeat units of the formula

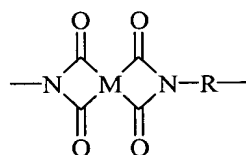


wherein R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; and T is a divalent radical of the formula

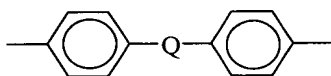


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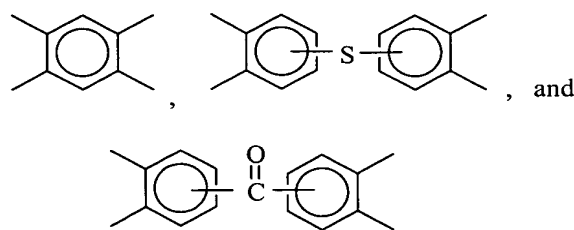
6. The composition of claim 1, wherein a thermoplastic polyimide comprises structural units of the formula



wherein R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; straight or branched chain alkylene radicals having about 2 to about 20 carbon atoms; cycloalkylene radicals having about 3 to about 20 carbon atoms, or divalent radicals of the formula



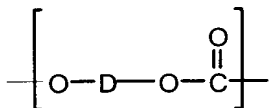
wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, or C_yH_{2y}, wherein y is an integer from 1 to 5; and M is selected from the group consisting of radicals of formula



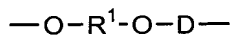
7. The composition of claim 1, wherein the second thermoplastic polymer is selected from the group consisting of polycarbonate esters, epoxy-functionalized polyolefins, poly(tetrafluoroethylene)s, polyetherimide-siloxane copolymers, polyarylates, polysulfones, polyether sulfones, and polyphenylene ethers, polyamides, polyesters, and combinations thereof.

8. The composition of claim 1, wherein the second thermoplastic polymer is selected from the group consisting of polycarbonate esters, epoxy-functionalized polyolefins, poly(tetrafluoroethylene)s, polyetherimide-siloxane copolymers, polyesters, and combinations thereof.

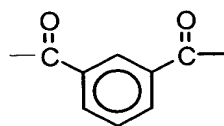
9. The composition of claim 1, wherein the second thermoplastic polymer is at least one polycarbonate ester comprising repeating polycarbonate chain units of the formula



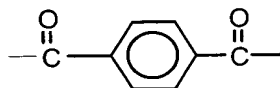
and recurring carboxylic chain units of the formula



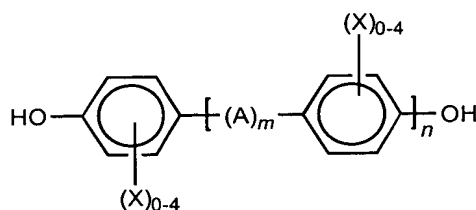
wherein R¹ is a divalent moiety of the formulae :



or



- 5 or the corresponding naphthalene derivatives, or mixtures thereof; and wherein each D is independently a divalent aromatic radical of a dihydric phenol represented by the formula



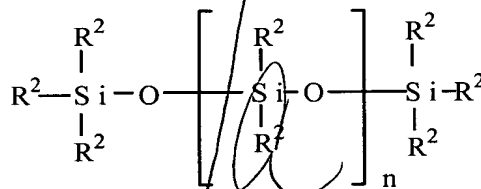
- 10 wherein A is selected from the group consisting of a divalent hydrocarbon radical containing from 1 to about 15 carbon atoms, a substituted divalent hydrocarbon radical containing from 1 to about 15 carbon atoms, $-\text{C}(\text{O})-$, $-\text{S}-$, $-\text{SS}-$, $-\text{S}(\text{O})_2-$, $-\text{O}-$, and $-\text{S}(\text{O})-$; each X is independently selected from the group consisting of hydrogen, halogen, and a monovalent hydrocarbon radical, wherein said hydrocarbon radical is an alkyl group of from 1 to about 8 carbon atoms, an aryl group of from 6 to about 18 carbon atoms, an aralkyl group of from 7 to 14 carbon atoms, an alkaryl group of from 7 to about 14 carbon atoms, or an alkoxy group of from 1 to about 8 carbon atoms; and m is 0 or 1 and n is an integer of from 0 to about 5.

- 20 10. The composition of claim 1, wherein the second polymer is an epoxy-functionalized polyolefin comprising structural units derived

from ethylene and glycidyl methacrylate, with epoxy groups present in an amount in the range of from about 3 wt.% to about 18 wt.%.

11. The composition of claim 10 further comprising a poly(tetrafluoroethylene).

5 12. The composition of claim 1, wherein the poly(diorganosiloxane) has the formula

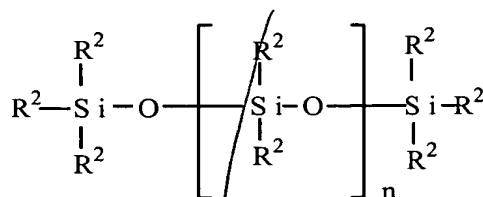


wherein each R² independently is hydrogen, C₁₋₁₅ alkyl, halogenated C₁₋₁₅ alkyl, fluorinated C₁₋₁₅ alkyl, C₂₋₁₀ alkenyl, C₅₋₁₂ cycloalkyl, C₆₋₁₂ aryl, or C₇₋₁₈ alkaryl, and wherein n is such that the compound has a nominal weight average molecular weight of from about 100,000 to about 1,500,000 grams/mole.

13. The composition of claim 12, wherein the poly(diorganosiloxane) has the formula MD_xM, or the formula M^{Vi}-D_xD^{Vi}_y-M^{Vi} containing about 0.25 mole % Vi groups.

14. The composition of claim 12, wherein the poly(diorganosiloxane) has a penetration value of less than or equal to about 800 mm.

15. The composition of claim 3, wherein the poly(diorganosiloxane) has the formula

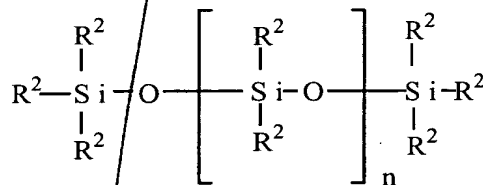


wherein each R² independently is hydrogen, C₁₋₁₅ alkyl, halogenated C₁₋₁₅ alkyl, fluorinated C₁₋₁₅ alkyl, C₂₋₁₀ alkenyl, C₅₋₁₂ cycloalkyl, C₆₋₁₂ aryl, or C₇₋₁₈ alkaryl, and wherein n is such that the compound has a nominal weight average molecular weight of from about 100,000 to about 1,500,000 grams/mole.

16. The composition of claim 15, wherein the poly(diorganosiloxane) has the formula MD_xM, or the formula M^{Vi}-D_xD^{Vi}_y-M^{Vi} containing about 0.25 mole % Vi groups.

17. The composition of claim 15, wherein the poly(diorganosiloxane) has a penetration value of less than or equal to about 800 mm.

18. The composition of claim 8, wherein the poly(diorganosiloxane) has the formula



wherein each R² independently is hydrogen, C₁₋₁₅ alkyl, halogenated C₁₋₁₅ alkyl, fluorinated C₁₋₁₅ alkyl, C₂₋₁₀ alkenyl, C₅₋₁₂ cycloalkyl, C₆₋₁₂ aryl, or C₇₋₁₈ alkaryl, and wherein n is such that the compound has a nominal weight average molecular weight of from about 100,000 to about 1,500,000 grams/mole.

19. The composition of claim 18, wherein the poly(diorganosiloxane) has the formula MD_xM , or the formula $M^{Vi}_x-D_xD^{Vi}_y-M^{Vi}_z$ containing about 0.25 mole % Vi groups.

20. The composition of claim 18, wherein the poly(diorganosiloxane) has a penetration value of less than or equal to about 800 mm.

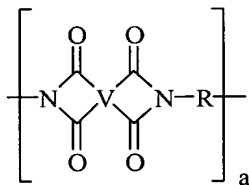
21. The composition of claim 1, further comprising at least one additive selected from the group consisting of pigments, titanium dioxide, carbon black, reinforcing agents, fillers, fumed silica, mold release agents, flow promoters, processing aids, colorants, ultraviolet screening agents, lubricants, viscosity modifiers, heat stabilizers, flame retardants, and combinations thereof.

22. An article of manufacture molded from the composition of claim 1.

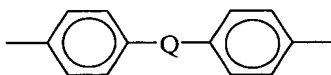
23. A method of making a polyimide molding composition, which comprises blending

- (a) at least one thermoplastic polyimide resin;
 (b) at least one second thermoplastic resin which is chemically distinct from the polyimide resin; and
 (c) a poly(diorganosiloxane).

24. The method of claim 23, wherein a polyimide resin (a) comprises repeat units of the formula

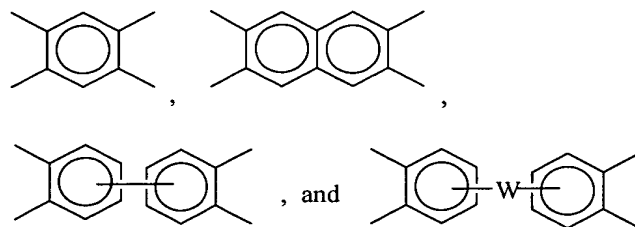


wherein a is an integer from about 10 to about 10,000; V is a tetravalent linker selected from the group consisting of substituted and unsubstituted, saturated, unsaturated and aromatic monocyclic and polycyclic groups having about 5 to about 50 carbon atoms, substituted and unsubstituted, linear and branched, saturated and unsaturated alkyl groups having 1 to about 30 carbon atoms; and combinations thereof; and R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; straight and branched chain alkylene radicals having about 2 to about 20 carbon atoms; cycloalkylene radicals having about 3 to about 20 carbon atoms, and divalent radicals of the formula



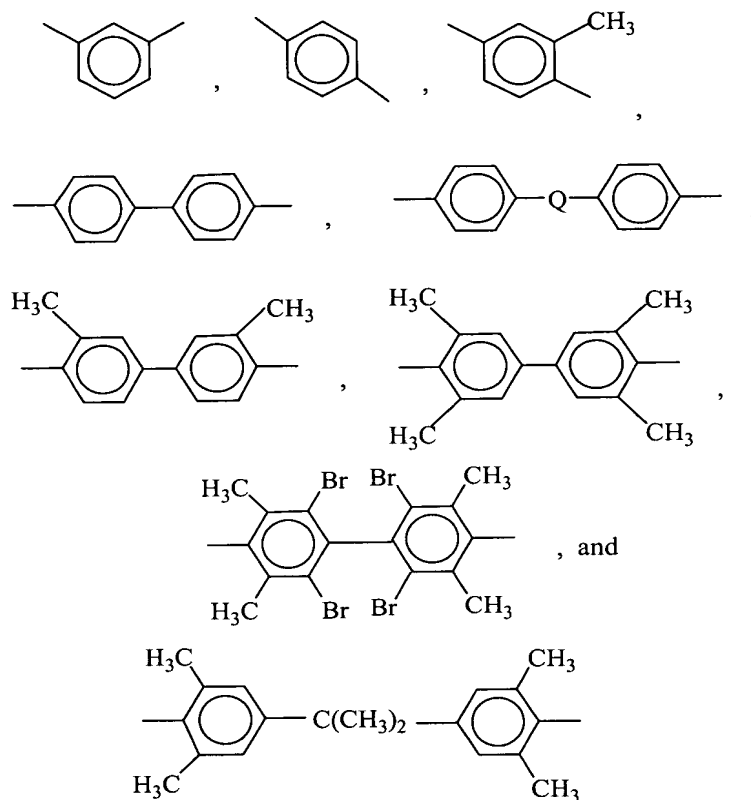
wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, and C_yH_{2y}, wherein y is an integer from 1 to 5, and halogenated derivatives thereof.

25. The method of claim 24, wherein V is selected from the group consisting of tetravalent aromatic radicals of formula



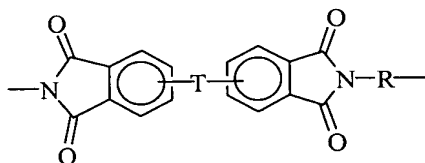
wherein W is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, C_yH_{2y} wherein y is an integer from 1 to 5, or a group of the formula -O-Z-O- wherein the divalent bonds of the -O- or the -O-Z-O-

group are in the 3,3', 3,4', 4,3', or the 4,4' positions, and wherein Z is selected from the group consisting of divalent radicals of formula



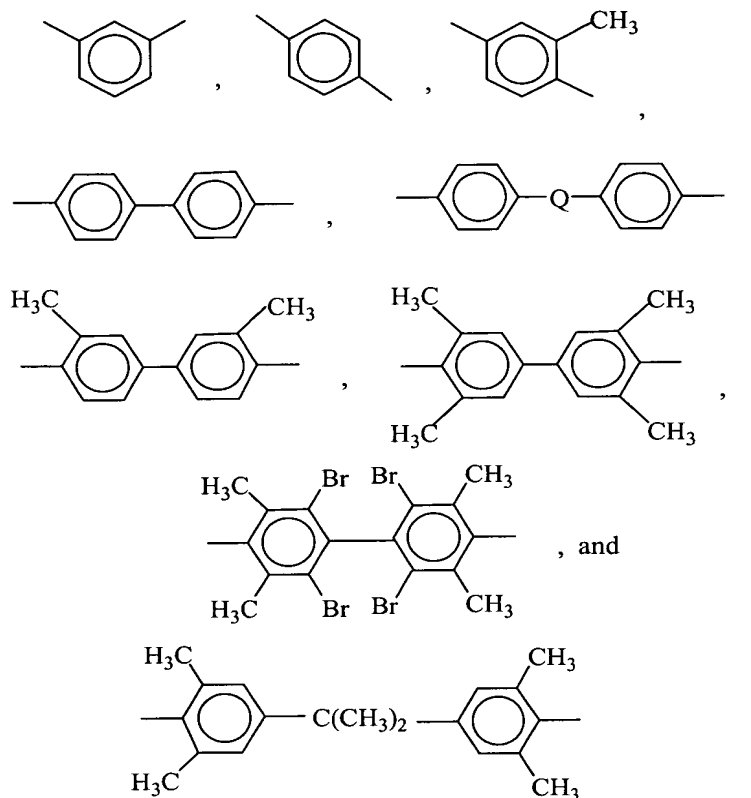
wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, and C_yH_{2y}, wherein y is an integer from 1 to 5, and halogenated derivatives thereof.

26. The method of claim 23, wherein a thermoplastic polyimide resin comprises repeat units of the formula

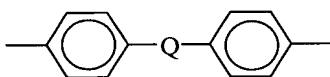


wherein T is -O- or a group of the formula -O-Z-O- wherein the divalent bonds of the -O- or the -O-Z-O- group are in the 3,3', 3,4', 4,3', or the 4,4'

positions, and wherein Z is selected from the group consisting of divalent radicals of formula

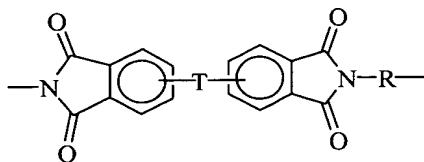


wherein Q is a divalent moiety selected from the group consisting of -
 5 O-, -S-, -C(O)-, -SO₂-, and C_yH_{2y}, wherein y is an integer from 1 to 5, and
 halogenated derivatives thereof; and R is selected from the group consisting
 of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms
 and halogenated derivatives thereof; straight and branched chain alkylene
 radicals having about 2 to about 20 carbon atoms; cycloalkylene radicals
 10 having about 3 to about 20 carbon atoms, and divalent radicals of the formula

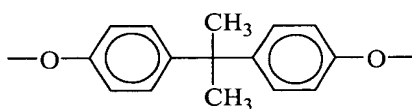


wherein Q is as defined above.

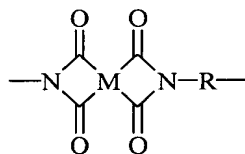
27. The method of claim 23, wherein a thermoplastic polyimide resin comprises repeat units of the formula



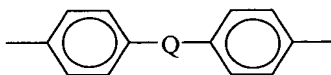
wherein R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; and T is a divalent radical of the formula



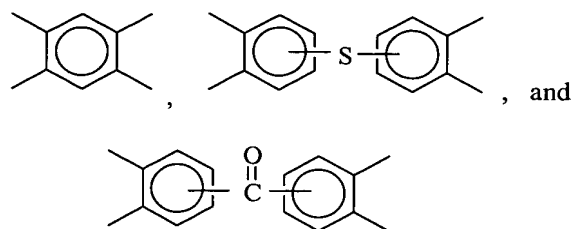
28. The method of claim 23, wherein a thermoplastic polyimide comprises structural units of the formula



wherein R is selected from the group consisting of aromatic hydrocarbon radicals having about 6 to about 20 carbon atoms and halogenated derivatives thereof; straight or branched chain alkylene radicals having about 2 to about 20 carbon atoms; cycloalkylene radicals having about 3 to about 20 carbon atoms, or divalent radicals of the formula



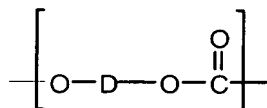
wherein Q is a divalent moiety selected from the group consisting of -O-, -S-, -C(O)-, -SO₂-, or C_yH_{2y}, wherein y is an integer from 1 to 5; and M is selected from the group consisting of radicals of formula



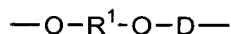
29. The method of claim 23, wherein the second thermoplastic polymer is selected from the group consisting of polycarbonate esters, epoxy-functionalized polyolefins, poly(tetrafluoroethylene)s, polyetherimide-siloxane copolymers, polyarylates, polysulfones, polyether sulfones, and polyphenylene ethers, polyamides, polyesters, and combinations thereof.

30. The method of claim 23, wherein the second thermoplastic polymer is selected from the group consisting of polycarbonate esters, epoxy-functionalized polyolefins, poly(tetrafluoroethylene)s, polyetherimide-siloxane copolymers, polyesters, and combinations thereof.

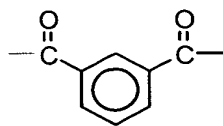
31. The method of claim 23, wherein the second thermoplastic polymer is at least one polycarbonate ester comprising repeating polycarbonate chain units of the formula



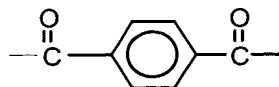
and recurring carboxylic chain units of the formula



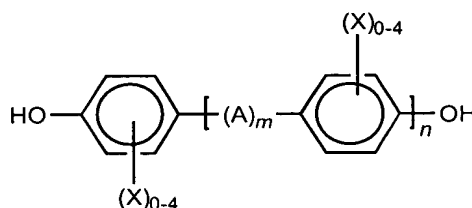
wherein R^1 is a divalent moiety of the formulae :



or



or the corresponding naphthalene derivatives, or mixtures thereof; and
 5 wherein each D is independently a divalent aromatic radical of a dihydric phenol represented by the formula



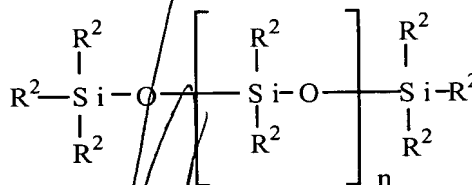
wherein A is selected from the group consisting of a divalent hydrocarbon radical containing from 1 to about 15 carbon atoms, a substituted divalent hydrocarbon radical containing from 1 to about 15
 10 carbon atoms, —C(O)— , —S— , —SS— , $\text{—S(O)}_2\text{—}$, —O— , and —S(O)— ; each X is independently selected from the group consisting of hydrogen, halogen, and a monovalent hydrocarbon radical, wherein said hydrocarbon radical is an alkyl group of from 1 to about 8 carbon atoms, an aryl group of from 6 to
 15 about 18 carbon atoms, an aralkyl group of from 7 to 14 carbon atoms, an alkaryl group of from 7 to about 14 carbon atoms, or an alkoxy group of from 1 to about 8 carbon atoms; and m is 0 or 1 and n is an integer of from 0 to about 5.

32. The method of claim 23, wherein the second polymer is
 20 an epoxy-functionalized polyolefin comprising structural units derived from

ethylene and glycidyl methacrylate, with epoxy groups present in an amount in the range of from about 3 wt.% to about 18 wt.%.

33. The method of claim 32 further comprising a poly(tetrafluoroethylene).

5 34. The method of claim 23, wherein the poly(diorganosiloxane) has the formula

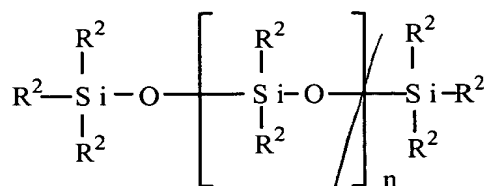


10 wherein each R² independently is hydrogen, C₁₋₁₅ alkyl, halogenated C₁₋₁₅ alkyl, fluorinated C₁₋₁₅ alkyl, C₂₋₁₀ alkenyl, C₅₋₁₂ cycloalkyl, C₆₋₁₂ aryl, or C₇₋₁₈ alkaryl, and wherein n is such that the compound has a nominal weight average molecular weight of from about 100,000 to about 1,500,000 grams/mole.

15 SUB 35. The method of claim 34, wherein the poly(diorganosiloxane) has the formula MD_xM, or the formula M^{Vi}-D_xD^{Vi}_y-M^{Vi} containing about 0.25 mole % Vi groups.

36. The method of claim 34, wherein the poly(diorganosiloxane) has a penetration value of less than or equal to about 800 mm.

20 37. The method of claim 25, wherein the poly(diorganosiloxane) has the formula

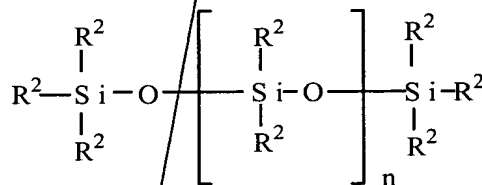


wherein each R² independently is hydrogen, C₁₋₁₅ alkyl, halogenated C₁₋₁₅ alkyl, fluorinated C₁₋₁₅ alkyl, C₂₋₁₀ alkenyl, C₅₋₁₂ cycloalkyl, C₆₋₁₂ aryl, or C₇₋₁₈ alkaryl, and wherein n is such that the compound has a nominal weight average molecular weight of from about 100,000 to about 1,500,000 grams/mole.

38. The method of claim 37, wherein the poly(diorganosiloxane) has the formula MD_xM, or the formula M^{Vi}-D_xD^{Vi}_y-M^{Vi} containing about 0.25 mole % Vi groups.

39. The method of claim 37, wherein the poly(diorganosiloxane) has a penetration value of less than or equal to about 800 mm.

40. The method of claim 30, wherein the poly(diorganosiloxane) has the formula



wherein each R² independently is hydrogen, C₁₋₁₅ alkyl, halogenated C₁₋₁₅ alkyl, fluorinated C₁₋₁₅ alkyl, C₂₋₁₀ alkenyl, C₅₋₁₂ cycloalkyl, C₆₋₁₂ aryl, or C₇₋₁₈ alkaryl, and wherein n is such that the compound has a nominal weight average molecular weight of from about 100,000 to about 1,500,000 grams/mole.

41. The method of claim 40, wherein the poly(diorganosiloxane) has the formula MD_xM , or the formula $M^{Vi}_x-D_xD^{Vi}_y-M^{Vi}_z$ containing about 0.25 mole % Vi groups.

42. The method of claim 40, wherein the poly(diorganosiloxane) has a penetration value of less than or equal to about 800 mm.

43. The method of claim 23, further comprising at least one additive selected from the group consisting of pigments, titanium dioxide, carbon black, reinforcing agents, fillers, mold release agents, flow promoters, processing aids, colorants, ultraviolet screening agents, lubricants, viscosity modifiers, heat stabilizers, flame retardants, and combinations thereof.

44. The method of claim 23, wherein a poly(diorganosiloxane) is first dispersed into a matrix selected from the group consisting of at least one thermoplastic polyimide resin (a), at least one second thermoplastic resin (b) which is chemically distinct from any thermoplastic polyimide resin, a high surface area inorganic material selected from the group consisting of silica, titania, alumina, Wollastonite, clays, bentonite, kaolin, zeolites, barium sulfate, and carbon black, and a mixture of any two or more of the foregoing, prior to blending with the other components.

45. The method of claim 23, wherein a poly(diorganosiloxane) is first dispersed into an inorganic matrix selected from the group consisting of silica, titania, alumina, Wollastonite, clays, bentonite, kaolin, zeolites, barium sulfate, and carbon black, and then dispersed into an organic matrix selected from the group consisting of at least one thermoplastic polyimide resin (a), at least one second thermoplastic resin (b) which is chemically distinct from any polyimide resin, and a mixture of any two or more of the foregoing.

46. A polyimide molding composition comprising:

(a) at least one thermoplastic polyetherimide resin comprising structural units derived from meta-phenylene diamine and 2, 2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride;

(b) a polycarbonate ester resin having about 60% ester units relative to carbonate units, and comprising structural units derived from bisphenol-A and about a 1:1 ratio of isophthalic acid to terephthalic acid;

(c) a poly(diorganosiloxane) of the formula MD_xM , or a poly(diorganosiloxane) of the formula $M^{Vi}-D_xD^{Vi}_y-M^{Vi}$ containing about 0.25 mole % Vi groups; and

(d) optionally at least one additive selected from the group consisting of pigments, titanium dioxide, carbon black, reinforcing agents, fillers, fumed silica, mold release agents, flow promoters, processing aids, colorants, ultraviolet screening agents, lubricants, viscosity modifiers, heat stabilizers, flame retardants, and combinations thereof.

47. The composition of claim 46, wherein polycarbonate ester is present in the composition in the range of from about 5% to about 95%, by weight, based on combined weight of components (a) and (b); poly(diorganosiloxane) is present in the composition in the range of about 0.1-10%; and fumed silica is optionally present in the composition in an amount of from about 30 to about 100 parts by weight based on the weight of the poly(diorganosiloxane).

48. The composition of claim 47 containing fumed silica.

49. The composition of claim 48 containing carbon black.

50. The composition of claim 46 containing carbon black.

51. A polyimide molding composition comprising:

(a) at least one thermoplastic polyetherimide resin comprising structural units derived from meta-phenylene diamine and 2, 2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride;

(b) an epoxy-functionalized polyolefin comprising structural units derived from ethylene and glycidyl methacrylate, with epoxy groups present in an amount in the range of from about 3 wt.% to about 18 wt.%;

(c) a poly(diorganosiloxane) of the formula MD_xM , or a poly(diorganosiloxane) of the formula $M^{Vi}_x-D_xD^{Vi}_y-M^{Vi}$ containing about 0.25 mole % Vi groups; and

(d) optionally at least one additive selected from the group consisting of pigments, titanium dioxide, carbon black, reinforcing agents, fillers, fumed silica, mold release agents, flow promoters, processing aids, colorants, ultraviolet screening agents, lubricants, viscosity modifiers, heat stabilizers, flame retardants, and combinations thereof.

52. The composition of claim 51, wherein epoxy-functionalized polyolefin is present in the composition in the range of from about 1% to about 20%, by weight, based on combined weight of resinous components; poly(diorganosiloxane) is present in the composition in the range of about 0.1-10%; and fumed silica is optionally present in the composition in an amount of from about 30 to about 100 parts by weight based on the weight of the poly(diorganosiloxane).

53. The composition of claim 52 containing fumed silica.

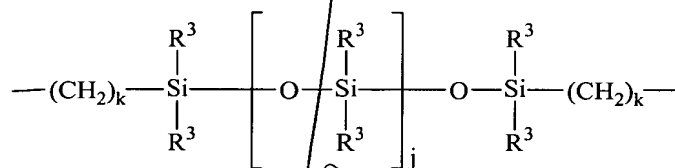
54. The composition of claim 51 further comprising a poly(tetrafluoroethylene) present in an amount in the range from about 0.3 to about 20 % based on weight of the total composition.

55. A polyimide molding composition comprising:

(a) at least one thermoplastic polyetherimide resin comprising structural units derived from meta-phenylene diamine and 2, 2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride;

(b) an epoxy-functionalized polyolefin comprising structural units derived from ethylene and glycidyl methacrylate, with epoxy groups present in an amount in the range of from about 3 wt.% to about 18 wt.%;

(c) a polyetherimide-siloxane random copolymer containing structural units derived from meta-phenylene diamine, 2, 2-bis[4-(3,4-dicarboxyphenoxy)-phenyl]propane dianhydride, and a poly(dimethylsiloxane) of the formula



wherein k is 3 and j is about 10;

(d) a poly(tetrafluoroethylene); and

(e) optionally at least one additive selected from the group consisting of pigments, titanium dioxide, carbon black, reinforcing agents, fillers, fumed silica, mold release agents, flow promoters, processing aids, colorants, ultraviolet screening agents, lubricants, viscosity modifiers, heat stabilizers, flame retardants, and combinations thereof.

56. The composition of claim 55, wherein epoxy-functionalized polyolefin is present in the composition in the range of from about 1% to about 20%, by weight, based on combined weight of resinous components; polyetherimide-siloxane copolymer is present in the composition in the range of about 0.1-10%; and poly(tetrafluoroethylene) is present in an amount in the range of from about 0.3 to about 20 % based on weight of the total composition.